CLAIMS

What is claimed is:

1. A method of manufacturing strained billets from metal chips, comprising the steps of:
crushing said chips into particles;
cleaning said particles;
cold molding of said particles into cylindrical shape briquettes;
placing said briquettes into a capsule;
sealing-in said capsule with upper and lower butt-end covers;
heating said capsule to a temperature in the range of 900 - 1080 deg C, and maintaining it at this temperature for a time sufficient for temperature equalization throughout the capsule volume;
loading said capsule into the mould section of a pressing rig, said pressing rig further having an upper plunger with a principal press-washer and a lower plunger with an autonomous press washer each extending into said mould section on opposite ends of said capsule;
hot deforming said capsule in the axial direction, wherein said hot deformation is carried out by application of dynamic impingement force by said press washers uniformly applied over the surfaces of said capsule butt-end covers, with sufficient repetitions and magnitude of force to result in a billet having the desired relative density;
and subsequent cooling of said formed billet.

2. The method in accordance with claim 1, wherein said particles' sizes are in the range of 5 -20 mm.

3. The method of claim 1 wherein said metal is selected consisting of titanium alloys.

4. The method of claim 1 wherein said pressing rig is preheated to a temperature not less than 0.2 that of the capsule temperature prior to placement of said capsule in said pressing rig;

5. The method of claim 1 wherein:
at least one of said butt-end covers has a diameter (reduced diameter) less than the capsule diameter by two thicknesses of the capsule cowling;
wherein the diameter of said press-washer (reduced diameter) adjacent to said reduced diameter butt-end cover is also less than the capsule diameter by two thicknesses of the capsule cowling; and
wherein said reduced diameter press-washer in cooperation with said mould section forms a chamber to receive capsule cowling shed during said hot deforming step.

6. The method of claim 5 wherein:
the sum of each said chamber volume and change in volume experienced by said capsule during hot deformation define a work space; and
wherein the height of said work space is defined by: N x (H_1 - H_2), where N is chosen from the range consisting of 1.2 - 1.5, and H_1 and H_2 are the capsule pre- and post- hot deformation axial dimensions.

7. The method of claim 1 wherein said cleaning step comprises the steps of: rinsing, drying and magnetic separation.

8. The method of claim 1 wherein:
said cleaned particles are further subjected to vacuum thermal degassing (VTD), said VTD comprising the steps of:
heating said particles to a temperature in the range of 550 - 650 deg C under a vacuum pressure of 5 x 10-3 mm Hg,
maintaining said particles at said temperature and pressure for a time duration of about 1 to 2 hours,

cooling said particles down to about 200 deg C at said vacuum pressure,
and cooling said particles to ambient pressure and temperature.

9. The method of claim 1, wherein said cold molding step results in briquettes having relative density of at least 0.6.

10. The method of claim 1, wherein said hot deformation step results in a deformation degree value of capsule deformation of at least 35%.

11. The method of claim 1, wherein said hot deformation step results in a billet relative density of at least 0.95.

12. The method of claim 1, wherein said hot deformation temperature is in the range of 900 - 1050 deg C.

13. A pressing rig apparatus for manufacturing a billet from cold pressed metal chip scrap briquettes contained in a capsule, said apparatus comprising:
a basis;
a container mounted on said basis,
a mould having two open ends, located in said container to receive said capsule,
an upper plunger having one end extending into one end of said mould,
a principal press-washer fixedly attached to said upper plunger end;
a lower plunger located on said basis and having an end that extends into the second end of said mould;
an autonomous press-washer fixedly attached to said lower plunger end;
and wherein said principal and autonomous press-washers are located on opposite ends of the long axis of said capsule and oriented facing each other;
and means for causing said press-washers to repetitively exert axial force on said capsule butt-end covers resulting in hot deformation of said capsule.

14. The device of claim 13 wherein:
at least one or both of the diameters of said principal and autonomous press-washers are less ("reduced diameter") than the internal diameter of the mould by two thicknesses of said capsule cowling;
and each said reduced diameter press-washer cooperates with said mould inner surface to form a chamber to receive capsule cowling shed during hot deformation.

15. The device of claim 14 further comprising:
a work space defined by the sum of each said chamber volume and change in volume experienced by said capsule during hot deformation; and
wherein the height of said work space is defined by: $N \times (H_1 - H_2)$, where N is chosen from the range consisting of 1.2 - 1.5, and H_1 and H_2 are the capsule pre- and post- hot deformation axial dimensions.